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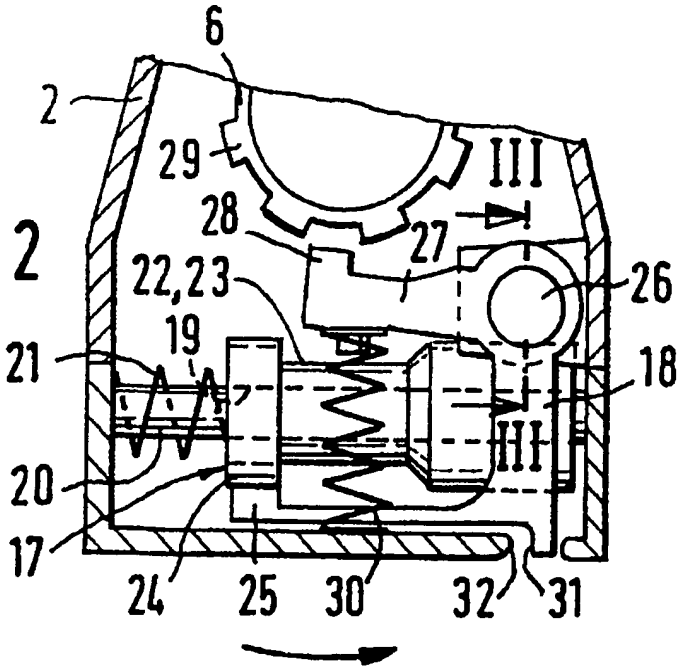
(54) Machine hand-tool.

(57) Machine hand-tool, especially a drill, having a tool holder rotationally driven via a spindle (6) and having a safety mechanism (16) which, in the event of the tool suddenly jamming, prevents the housing (2) of the machine from rotating. For this purpose, the machine exhibits an inert weight (17), which is movably mounted and exhibits a contact element (22) with which a pre-tensioned switching member (18) having a latching arm (27) interacts. Upon being triggered, the switching member (18) pivoted to the housing (2) at (26) engages in a toothing (29) of the spindle (6) and thus jams the housing (2) in relation to the stationary spindle (6).

FIG. 2



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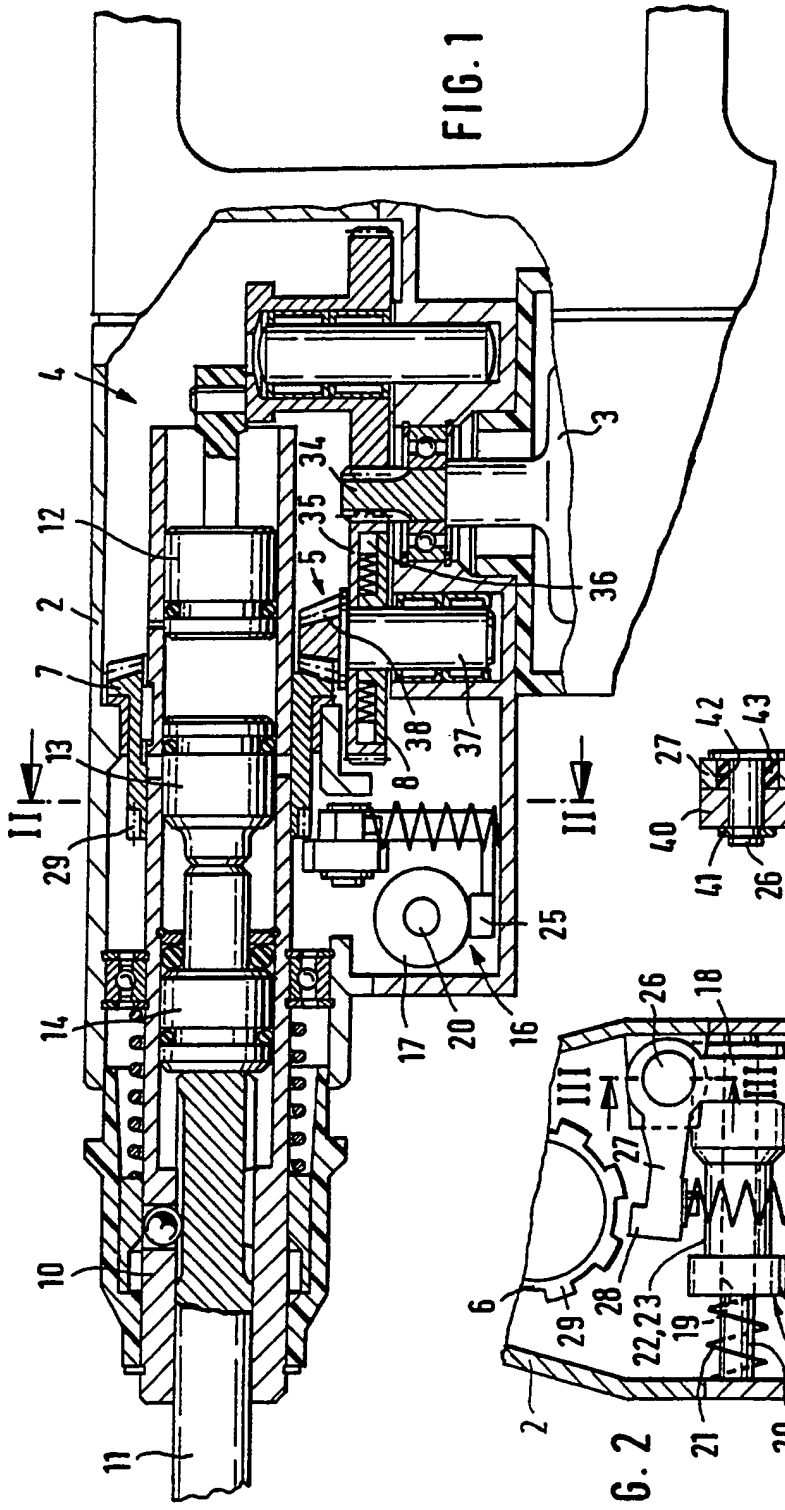

FIG. 1

FIG. 3

FIG. 2

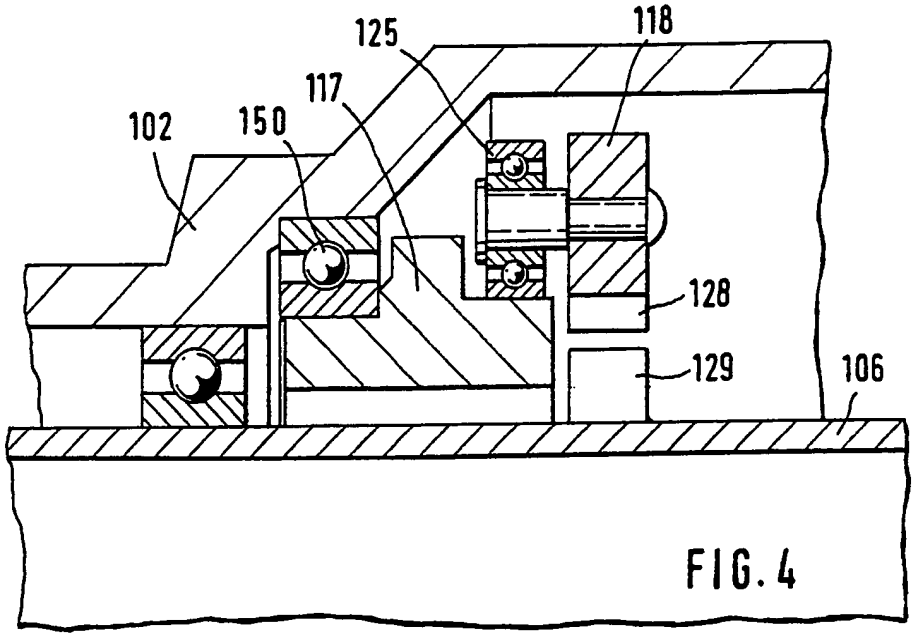
125
118
117
102
150
128
129
106

FIG. 4

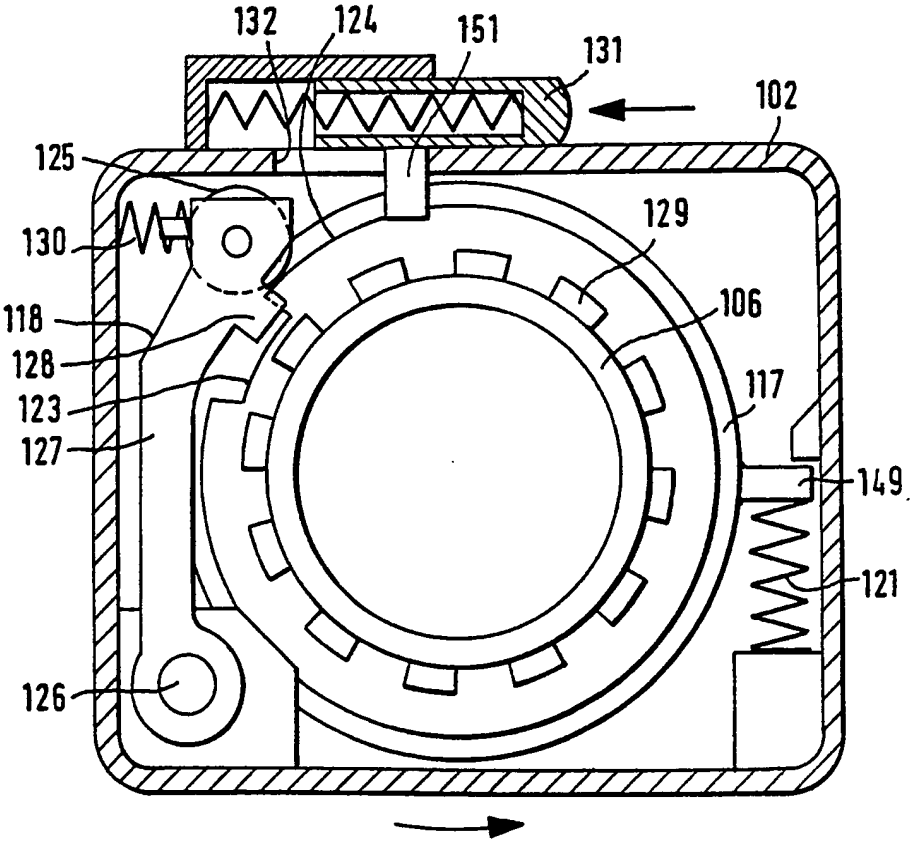
132
124
151
131
102
125
130
129
118
106
128
117
123
127
149
121
126

FIG. 5

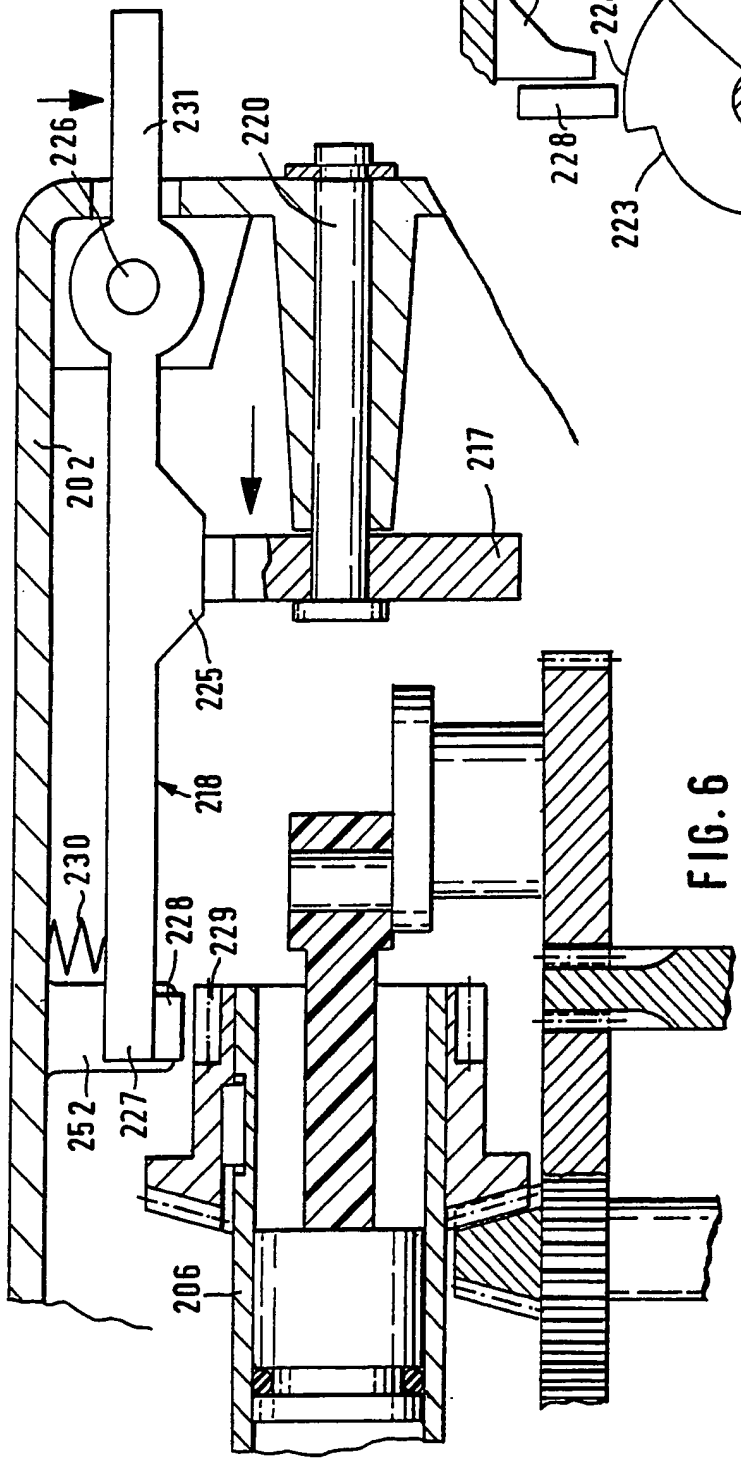
226
231
220
202
217
225
218
230
228
229
252
227
206

FIG. 6

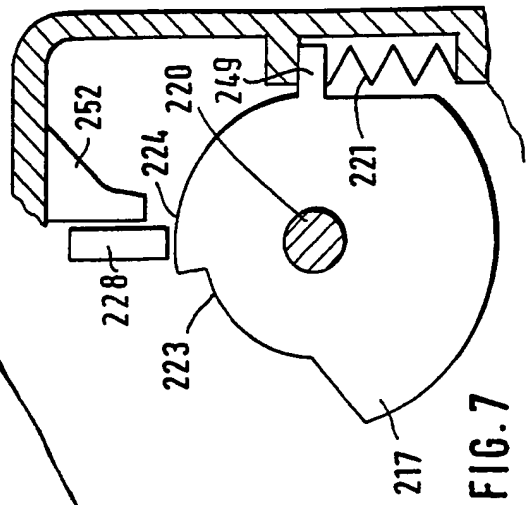
252
220
249
224
221
228
223
217

FIG. 7

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Machine hand-tool

Prior Art

The invention is derived from a machine hand-tool according to the preamble of Claim 1. From EP 326 783 B1, a machine of this type is already known in which, if the tool suddenly jams, the housing is coupled by means of a wrap spring to the fixed spindle. The effectiveness of this measure is critically dependent upon the braking moment which is generated between the wrap spring and the spindle. Since the housing continues to further rotate prior to a rigid coupling to the spindle being achieved, the torsional angle for a secure holding of the machine hand-tool can already become too great.

Advantages of the invention

The machine hand-tool according to the invention, having the characterizing features of Claim 1, has the advantage in contrast to the above that it couples the housing which is starting to rotate abruptly to the jammed spindle. This can either result in the tool being torn loose again and the drilling procedure being able to be continued or in a safety coupling in the rotary drive strand of the machine hand-tool disconnecting the onward running motor from the spindle.

The triggering of the safety cut-off is herein dependent upon the holding strength of the operator, i.e. only if

the machine, under too weak a grip, wriggles out of the operator's hand, is the safety mechanism triggered.

As a result of the measures listed in the contingent [sic], advantageous refinements and improvements of the machine hand-tool defined in Claim 1 are possible.

Drawing

A plurality of illustrative embodiments of the invention are represented in the drawing and explained in greater detail in the subsequent description. Figure 1 shows a longitudinal section through a first illustrative embodiment. Figure 2 shows a cross-section according to the line II-II in Figure 1, Figure 3 shows in detail a section according to the line III-III in Figure 2. Figures 4 and 5 show a second illustrative embodiment, Figure 5 representing a section according to the line V-V in Figure 4. Figures 6 and 7 show a third illustrative embodiment.

Description of the illustrative embodiment

A machine hand-tool configured as a drill hammer exhibits a housing 2 in which there are housed an electric motor 3, a striking mechanism 4 and a rotary drive gearing 5. The rotary drive is transmitted to a right-turning spindle 6 of hollow construction, to which a gearwheel 7 is connected in a rotationally secure arrangement. The rotary drive gearing 5 contains, in the drive strand between the motor 3 and the spindle 6, a safety coupling 8.

The spindle 6 is connected to a tool holder 10 into which a drilling tool 11 can be inserted in a rotationally locking arrangement. The tool holder 10 could also however be disposed in a rotationally secure arrangement on the housing, so that only the front end of the spindle is connected in a rotationally locking arrangement to the

drilling tool. Within the spindle 6 there is located the pneumatic striking mechanism 4 exhibiting a piston 12, which is driven mechanically to and fro, a striker 13 and a snap die 14. The latter acts directly upon the shank end of the drilling tool 11.

In the housing 2, there is further disposed a safety mechanism 16 for cutting off the rotary drive. Its essential parts are a weight 17 and a switching member 18. The weight 17 has approximately the form of a yarn spool and is mounted, by its central bore 19, movably on a housing-fixed receiving fixture configured as an axle 20. This runs, at a distance from the spindle 6, in a tangential direction to the said spindle. The weight 17 is forced to the right on the axle 20 by a weak restoring spring 21 which is disposed, in the direction of view onto the tool 11, to the left of the said weight, so that, when the housing 2 is rotated to the left in the direction of the arrow, the said weight has left to it, as an inert mass, a path of displacement leftwards towards the restoring spring 21. In its middle peripheral section, the weight 17 exhibits, as a contact element 22, an annularly closed indent 23. This could also extend longitudinally in the axial direction in the event of the weight 17 being mounted in a rotationally locking arrangement on the axle 20. Next to the indent 23 there remains a raised collar 24, on which there rests, in normal operation, a switching arm 25 of the switching member 18.

The switching member 18 is mounted pivotably on a journal 26 held parallel to the spindle 6 in the housing 2. It exhibits, apart from the switching arm 25, a latching arm 27, which runs away from the journal 26 approximately tangentially towards the spindle 6 and supports at the end a latching hook 28. This is shaped such that, when the switching member 18 is pivoted, it is able to engage in a toothing 29 on the spindle or on the gearwheel 7 thereto connected in a rotationally locking arrangement.

The latching arm 27 is acted upon, in an approximately radial direction to the spindle 6, by a spring 30. In normal operation, the latching arm 27 is, however, kept disengaged from the toothing 29 by the switching arm 25. The switching member 18 additionally exhibits a resetting element 31, which is here fitted as a lever to the switching arm 25 and is accessible from outside via a housing opening 32. As protection against unintentional actuation or jamming, the resetting element 31 is disposed in a sunken arrangement. The resetting element 31 can also, for example, be actuated by an electromagnet, by electromechanical means, via a suitable switch on the housing.

The safety coupling 8 is configured such that a spur wheel 35 meshing with the pinion 34 of the motor 3 is connected via spring-loaded latching members 36 to their shaft 37. The shaft 37 supports a bevel wheel 38, which meshes with the gearwheel 7. When a predefined limit torque between the spur wheel 35 and the (jammed) bevel wheel 38 is exceeded, the latching members 36 over-latch and thus uncouple the tool holder 10 from the motor 3. Owing to the safety mechanism 16, the limit torque can either be chosen to be high, for example to enable heavy works to be carried out by physically strong operators, or can offer - in a low setting - redundant safety.

In Figure 3, the mounting of the switching member 18 on the journal 26 is shown. The journal 26 itself is held unyieldingly in an eyelet 40 of the housing 2 and fixed by means of a securing ring 41. Between an eye 42 of the latching arm 27 and the journal 26 there is inserted, for damping purposes, a ring 43 made from rubber or some other elastic material.

In normal operation of the drill hammer, the elements of the safety mechanism 16 are located in the original position represented in Figures 1 and 2. If the right-turning drilling tool suddenly, for example owing to a

reinforcement iron, catches in the drilling floor and no longer further rotates, the housing 2 starts to rotate abruptly to the left in the direction of the arrow. The weight, due to its inertia and its mobility on the axle 20, remains still, i.e. it is displaced to the left in relation to the housing 2 and the switching member 18. The switching arm 25 hereupon makes its way into the indent 23 and the spring 30 forces the latching arm 27 against the spindle 6, into its toothing 29. The housing 2 is now coupled abruptly, in a rotationally secure arrangement, to the stationary spindle 6. If the motor still continues to run, the drilling tool 11 can in some circumstances be torn loose and the drilling works continued. If this fails to occur, then the safety coupling 8 disconnects the motor 3 from the fixed spindle 6. After the motor has been cut off and the drilling tool freed, the rotary drive is released again by manual actuation of the resetting element 31. The switching arm 25 hereupon leaves the indent 23, so that the spindle 6 can be freely rotated again in relation to the housing 2. At the same time, the restoring spring 21 displaces the weight 17 to the right into its original setting for the drilling operation.

As an additional safety measure, provision can be made to assign to the switching member 18 a limit switch for cutting off the motor 3. This limit switch would be actuated, for example, by the latching arm 27 as it latch-locks into the toothing 29. Owing to the running-on of the motor armature and of the rotary drive gearing 5, a safety coupling 8 is still however in most cases required.

From the second illustrative embodiment according to Figures 4 and 5, only the functional parts of the safety mechanism are diagrammatically shown. For equal-function individual elements, reference numerals are used which are increased by 100 in relation to the first illustrative embodiment.

A spindle 106 having a toothing 129 is mounted rotatably in a housing 102. A weight 117 is configured as a ring and is mounted in a low-friction bearing 150 coaxially to the spindle 106, likewise in the housing 102. The weight 117 is held in its original position on a radial projection 149 by a weak restoring spring 121 supported on the housing 102. The contact element 122 is disposed, as a short groove 123 of a few angular degrees, on the periphery of the weight 117. Next to the groove 123, a switching roller 125 mounted on the switching member 118 bears against the non-indented periphery 124 of the weight 117, which switching roller is configured as the outer ring of a ball bearing. The switching member 118 is mounted pivotably about a housing-fixed journal 126 and is pretensioned by means of a spring 130 in the direction of the spindle 106. At the upper end, the switching member 118 exhibits a latching hook 128, which is designed to engage in the toothing 129 of the spindle 106. To the outside of the housing 102 there is fitted a resetting element 131, which is configured as a spring-loaded slide having a boss 151 reaching through a housing opening 132.

In normal operation shown in Figures 4 and 5, the switching roller 125 rests on the non-indented periphery 124 and the spindle 106 is able to rotate freely to drive a drilling tool. If the drilling tool jams in the drill hole, then the housing 102 starts to rotate abruptly to the left in the direction of the arrow. Due to its inertia, the weight lodges in its setting without being rotated along. The result of this is that the switching roller 125 rolls down on the periphery 124 and falls into the groove 123. As in the first illustrative embodiment, the latching hook 128 hereupon engages in the toothing 129 and secures the spindle 106 in relation to the housing 102.

For the release of the safety mechanism 116, the resetting element 131 is displaced against the force of its spring, whereupon the boss 151 acts upon the latching arm

127 and swivels this back against the spring 130. Upon this, the weight 117 is conveyed by the restoring spring 121 likewise into its original position.

From the third illustrative embodiment according to Figures 6 and 7, only the functional parts of the safety mechanism are shown, likewise diagrammatically. For equal-function individual elements, reference numerals are used which are increased by 200 in relation to the first illustrative embodiment.

The weight 217 of the safety mechanism 216 is mounted coaxially behind the spindle 206 so as to be rotatable on a housing-fixed axle 220 and is held in its original position by a restoring spring 221 which acts upon a radial projection 249. The said weight, like the weight 117 in the second illustrative embodiment, exhibits as the contact element 222 a groove 223 and a peripheral element 224 of wider diameter. Upon this there rests a switching arm 225 of a switching member 218. This switching member is mounted on a housing-fixed journal 226 and extends parallel to the spindle 206. At its end opposite to the journal 226, it supports a latching hook 228 for engagement in a toothing 229 on the spindle 206. The latching hook 228 can be supported laterally, where appropriate, elastically on housing ribs 252. The function of the resetting element 231 is performed by a lever jutting out of the rear of the housing 202.

The functioning of the safety mechanism 216 corresponds to that in the second illustrative embodiment. When triggered, the latching lever 230 swivels downwards and engages with its latching hook 228 in the toothing 229. The housing rib 252 prevents any lateral deviation. The hard latching engagement can be dampened by means of a rubber overlay fitted onto the housing rib 252. In order to restore the operativeness of the drill hammer, the resetting element 231 is actuated manually in the direction of the arrow.

The invention is not limited to the illustrative embodiments shown. In particular, elements of the one illustrative embodiment can be combined with elements of another. Apart from in the case of drills, the invention also finds application in respect of other machine hand-tools having a rotational working motion, for example saws.

Claims

1. Machine hand-tool, especially a drill, having a housing (2, 102, 202), a preferably electric motor (3, 103, 203) and a thereby rotationally driven spindle (6, 106, 206) and having a weight (17, 117, 217) which can be triggered by rotation of the housing (2, 102, 202) and exhibits a contact element (22, 122, 222), which contact element is movable relative to the housing (2, 102, 202) and approximately tangentially or in the peripheral direction to the spindle (6, 106, 206) and interacts with a spindle-halting switching member (18, 118, 218), characterized in that the switching member (18, 118, 218) is mounted in the housing (2, 102, 202) such that it can be pivoted in an at least approximately radial direction to the spindle (6, 106, 206) but, tangentially thereto, is fixed, and in that, when triggered by the weight (17, 117, 217), it can be latch-locked from an operating or starting setting, in particular by spring force, into the still rotating spindle (6, 106, 206).

2. Machine hand-tool according to Claim 1, characterized in that the contact element (22, 122, 222) is configured as an axially or radially disposed forward or backward projection (23, 123, 223) on the weight (17, 117, 217), the weight being disposed on a housing-fixed receiving fixture (20, 120, 220).

3. Machine hand-tool according to Claim 1 or 2, characterized in that the position of the contact element (22, 122, 222), disposed on the weight, relative to the housing (2, 102, 202), which position changes upon the abrupt rotation of the housing (2, 102, 202), causes the

switching member (18, 118, 218) to pivot into the latch-locking setting.

4. Machine hand-tool according to one of the preceding claims, characterized in that the weight (17) is mounted on an axle (20) such that it can be moved in a translatory motion.

5. Machine hand-tool according to one of Claims 1 to 3, characterized in that the weight (217) is mounted, in extension of the spindle (206), coaxially behind this rotatably on an axle (220).

6. Machine hand-tool according to one of the preceding claims, characterized in that the spindle (6, 106, 206) is toothed on its outer periphery in the region of the switching member (18, 118, 218).

7. Machine hand-tool according to one of the preceding claims, characterized in that in the drive strand between the motor (3) and the spindle (6, 106, 206) there is disposed a preferably over-latching, detachable coupling (8, 108, 208).

8. Machine hand-tool according to one of the preceding claims, characterized in that the switching member (18, 118, 218) is mounted, for shock absorption, elastically in the housing (2, 102, 202).

9. Machine hand-tool according to one of the preceding claims, characterized in that the switching member (18, 118, 218) exhibits a manually or electromechanically actuatable resetting element (31, 131, 231) which, after the jamming of the spindle (6, 106, 216 [sic]), conveys the switching member (18, 118, 218) back into its original position so as to release the rotary drive.

10. A machine hand tool substantially as herein described with reference to Figures 1 to 3, or Figures 4 and 5, or Figures 6 and 7 of the accompanying drawings.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report) - 11 -	Application number GB 9322591.0
Relevant Technical Fields (i) UK Cl (Ed.M) B4C (ii) Int Cl (Ed.5) B25D 11/00, 11/04, 11/06, 11/08, 11/10, 11/12; B25F 5/00; B23B 45/00, 45/02, 45/04	Search Examiner B F BAXTER Date of completion of Search 20 JANUARY 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASE: WPI	Documents considered relevant following a search in respect of Claims :- 1-10

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